

Metallurgy in the prehistory of South America: a synthetic overview.

Part I

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1. Research and the political setting

In most of Latin America metallurgy and gold are seen as synonyms. For most people, all the metal objects that were produced before the European conquest were made of gold. This has several important effects on the preservation and study of metallurgy. One of the pioneers of Colombian archaeology, Gerardo Reichel-Dolmatoff, once said something that at the time was regarded as outrageous; gold is the damnation of Colombian archaeology. On the light of what has happened during the past 500 years we tend to agree with this statement, as will become evident to you along the conference.

1.1. Looting

The first and most harmful effect of the abundance of gold has been the incredible frequency and intensity of looting. Looting is, of course, a common occurrence in most regions of the world, but there are degrees of looting. In what is now known as Latin America looting started almost at the moment when the conquerors set foot in the first found lands. The greed for gold led many of the Spanish conquistadores, not only to grab whatever was available in the villages of the Indian communities but also to dig graves and sanctuaries where they presumed gold was buried. Captain Pedro de Heredia, the founder of the city of Cartagena, was famous for the extensive looting of large burial mounds in the Sinu region shortly after his arrival. In the province of Cañar, southern Ecuador, the Spaniards dug in 1563 a grave which belonged to a recently buried chief; his family was present and they had to beg the looters to let them take away the corpse without destroying it. Throughout the discovery and conquest of the new lands episodes

like those were repeated. Looting of Indian sites and the quest for gold became part of the colonial culture.

This tradition has not weakened; nowadays looting is known throughout South America as *guaqueria*, a word derived from the Quechua *huaca* or sanctuary. *Guaqueria* or grave looting is deeply embedded in the peasant culture of those regions where gold finds are frequent. During the second half of the nineteenth century and the first decades of the twentieth century in the Central Cordillera of Colombia a large scale peasant colonisation of new lands occurred and was accompanied by intensive looting; there is even a book written by one of the *guaquero* leaders describing the types of tombs and objects found. The gradual expansion of agriculture, forest clearance, mining and the construction of roads and other large structures has led to accidental finds of Indian graves which quickly develop into large scale looting.

When the tombs of the Lord of Sipan were found in the Moche area of northern Peru and the archaeologists intervened it was necessary to have the Peruvian army firing regularly their machine guns during the night in order to keep aggressive looters away. In spite of that, many grave goods from Sipan were stolen and they were traded in the international market by the prestigious Sotheby's and Christie's auction houses.

As recently as 1992, Malagana, a large cemetery was found in the vicinity of Cali, Colombia. In a matter of days there were several hundred persons looting in the area; the police and the army were called in and they were not able to stop the looters. It was even rumoured that the Major of the town where the discovery was made, was doing business with the looters and that the armed forces were actually regulating the looting in exchange for money. A handful of the gold objects found were recovered by the Museo del Oro of Bogotá; most of them made their way to the hands of foreign collectors in the United States, the United Kingdom, Switzerland and Belgium.

Such widespread greed for gold and the culture of looting has meant that many sites have been destroyed. Archaeologists certainly agree that nowadays it is virtually impossible to find undisturbed sites belonging to certain cultures such as Calima, Quimbaya, Pasto and Cañar, precisely because they had gold rich graves and have, thus, been looted to exhaustion. Only a handful of the gold objects in the public domain have been obtained through controlled archaeological digs, the rest comes from the purchase of looted sets.

The handicap introduced by this phenomenon in the research of metallurgy is enormous. Basically the whole context is lost and data concerning association, stratigraphic details and spatial relations is non-existent. Up to date there is scarce evidence concerning what seems to be a workshop in central Colombia, a large one in southern Ecuador, an arrangement of furnaces in the Sican area of Peru, a couple of Vicus sites in Lambayeque, a bronze workshop in the Argentinian northwest and small scale sites elsewhere; just that for what was a large scale industry, which produced thousands of objects in many different sites. Our knowledge of the chain of production, of the processing of metals and minerals, the fuels used, etc. is precarious. We are limited to a great degree to the study of the objects themselves without their context and even then, there are difficulties.

1.2. Collections and political manipulation

The reverse side of the coin with relation to looting is the activity of collecting. During most of the nineteenth century there was no real national interest on forming collections in any Latin-American country. In the meanwhile the large European museums had turned their eyes towards the continent. By the late 1800s most of what could be seized in Egypt, Greece, Italy, the near East and the far East had been divided among British, French and German museums, so that other areas of the world became interesting. Central and South America were explored for that purpose by all possible means. High rank diplomatic and consular officials were among the first to pursue these riches. By the early twentieth century, official missions from institutions such as the British Museum and the Museum für Volkerkunde of Berlin were actively importing objects, since in most Latin-American countries there were no laws prohibiting it. In some cases the expeditions were accompanied by ethnographers and archaeologists who wrote reports and left records of the sites and finds.

Eventually national collections began to form. At the beginning it was a matter of private individuals, some of them involved in elite intellectual circles where history and native cultures became fashionable and were studied. Some early collectors were merchants who came across indigenous objects accidentally, but being rich and learned they had the possibility of keeping them. The fate of these early collections was varied, some were sold to foreign buyers, others were dispersed

among the heirs of the original collectors and a few found their way to public museums. Exceptionally private collections acquired the character of true museums and established a permanent exhibition and public services; this is the case of the Museo del Oro del Peru and the Museo Larco, both in Peru, and the Museo del Alabado, in Quito, Ecuador.

Nevertheless, what was more significant in this process was the formation of public collections. In most Latin-American countries where this occurred the activity was sponsored and owned by the central banks. As surprising as it may sound, in this continent this made sense, since central banks were the only state institutions that had good financial resources, security and stability. Bank sponsored museums were established in Colombia in 1939, Ecuador in 1950, Costa Rica in 1950 and Peru in 1982. Each one has its particular history, but they all have in common at least three main things: the absence of museum policies with regard to the acquisition of objects for the collections; a very conservative and elite management of the exhibition and no real interest in the cultural and archaeological contexts of the objects. The collections grew steadily becoming, in some cases, very large. Gold was preferred over all other materials, even when it meant discarding very interesting objects of pottery, stone, wood, etc. In the case of the Museo del Oro in Colombia, metallic objects made of copper had little chance of being acquired and even less of being exhibited, the reason being that they were regarded as inferior with relation to gold objects and, therefore, not worthy of much attention.

All of these factors conspired to build a political manipulation of museum collections, particularly gold collections. In the hands of conservative elites these museums became elegant and refined sites where a particular notion of the past, the nation and national identity were portrayed and projected. The notion of archaeological objects as documents capable of conveying information about past societies came second. It became important, first of all, to build an “elegant” exhibition that would satisfy the refined taste of a few individuals. No effort whatsoever was made to share with native Indian communities the effort of interpreting their past or to interact with them in the construction of museum exhibitions. Once again gold and the greed that it awakens had determined this exclusive and unilateral handling of collections and museums. It took quite a long time to start changing this and even then to a very small degree. If we have to judge the situation nowadays, it would be closer to the truth to say that we are still handling the topic with a nineteenth century mentality.

2. The early origins of metallurgy in South America

There has not been up to date any archaeological project oriented towards the investigation of the origins of metallurgy in South America. Various early sites with metal finds, located in a large area between northern Chile and northern Ecuador, have been dated between 1800 and 700 b.C.E. Those finds represent an early stage in the development of metal work; it is at this period in history that the craft of metals began in South America. After the 7th century b.C.E. the panorama changes, there are many finds of highly elaborate metals in different zones; three well defined styles emerge (Chavín, Cupisnique and La Tolita-Tumaco) and metallurgy enters a phase of maturity.

2.1. Chile

The sites of Tulán 54 and Tulán 85 in Atacama, northern Chile, yielded burials with hammered gold and copper artefacts. Sites are dated between 1130 and 890 b.C.E. It is argued that herders that lived in the region in small dwellings around 1200 b.C.E. used native gold and copper, which was quite abundant in the area. Nothing else is known from that region for this period.

2.2. Bolivia

Copper slag has been found in Wankarani, southern Titicaca, dating from between 1210 and 800 b.C.E. In the nearby site of Chiripa, copper minerals, used as raw material, were dated to 1020, 950 and 900 b.C.E. There is a third site yielding metal finds, Pucara, probably contemporary to Wankarani and Chiripa. Apparently the lower levels of the large city of Tiahuanaco (approximately 1000 b.C.E.) yielded some copper slag. There was an acute shortage of available fuels in the Bolivian plateau, a fact that may have hindered the development of metallurgy. However, some authors argue that dried llama excrements could have been used for metal processing at the time, as they were in the Colonial era.

2.3. Peru

In the southern Titicaca basin the site of Jiskairumoko yielded some gold objects. The context is described as a community in transition between the hunting-gatherer mode and an agricultural-herder society. By 2300 b.C.E. a small village existed and pottery appeared by 1500 b.C.E. In a burial dated 1783 b.C.E. there was a necklace with gold and stone beads. Metal beads were hammered out of native gold chunks. The site of Waywaka, Andahuaylas department of south Peru, is widely known for a date, first cited as 1490 b.C.E. and then corrected to 1000 b.C.E. There were two burials, one with a set of nine gold leafs and the other with 25 leafs and the working tools of a metal smith inside a stone jar.

Mina Perdida is a large ceremonial site in the valley of the Lurin River; platforms and pyramids were built for over eight centuries. Copper sheets associated to dates of 1100, 1170, 1080 and 1070 b.C.E. were found in the filling of the structures. It seems that native copper was used to form thin sheets by hammering. In the same valley there is another site: Malpaso, where a copper-silver alloy bead was dated at 700 b.C.E. In the north coast, site of Puémpaue, a gilded copper disc was found covering the mouth of a corpse in a burial dated between 1500 to 1300 b.C.E. A nearby burial at Huaca La Merced had a gold ring and a copper nose ring; dates range from 800 to 700 b.C.E. There is also a burial with two copper discs in Kuntur Wasi, northern Sierra, dated to 910 b.C.E. Yet another set of burials in Morro de Etén, Lambayeque River, exhibited crowns and breastplates dated at 760 b.C.E. There are a few objects in the early phases of Chavin, found at Kotosh, dated to 1200, 1150, 1120, 1050, 920, 890 and 870 b.C.E. and in Chongoyape, probably before 700 b.C.E. These last ones are quite complex because they combine hammering and welding.

2.4. Ecuador

In the southern Sierra, the site of Putushio is noteworthy for the existence of a large complex of furnaces in what was probably the earliest metal workshop found in the continent. The most remarkable objects are small metal spheres cast in clay moulds. Dates start at 1470 b.C.E. but the metallurgical activity continues until 755 b.C.E. Gold, silver and copper objects are reported from Salango, central coast dated at 1500 b.C.E. A metal smith was buried in Los Cerritos, central coast

together with his tools in 890 b.C.E. Finally, in the north coast, site of Las Balsas, a small gold-silver-copper alloy sheet was dated between 720 and 710 b.C.E.

2.5. Summary

Even though this information is still incomplete, it is useful since it points out certain key facts associated with this Initial Period of metallurgy. First, the geographical distribution and chronology of the finds clearly suggests that there was no unique initial focus of development; on the contrary, it seems that in a large area between northern Chile and northern Ecuador, both in the Sierra and in the coast, different local communities experimented working metals at around the same time and that there was no communication or diffusion of experiences. Next, as new finds are announced it is evident that these processes are surprisingly early; probably around the end of the third millennium b.C.E. metals were already being used. Several sites have dates within the second millennium b.C.E. and many more at the beginning of the first millennium b.C.E.

The older age of metallurgy is interesting beyond its plain numerical value. Until recently there was a tendency, abundantly explained in publications, to associate the production and use of metals with what is termed as social complexity. The idea behind it is that metallurgy is an activity that can only be found in the presence of stable agricultural surpluses and a social hierarchy having on its peak an elite that used metal objects exclusively. It was said that societies not having these characteristics could not develop metallurgical industries. There are several arguments against this idea. The most important one arises precisely from the context of the sites containing very early metallurgical evidences. This is supported by the contexts of Jiskairumoko, the Chilean sites, Waywaka and the Ecuadorian sites. Metallurgy emerged in various types of communities, not only those that were in the process of becoming complex, such as Tiawanku, but also among herders, hunters, fishers and gatherers that had acquired certain degree of stability and an efficient exploitation of their environment.

The other important conclusion is that in all of the early sites the metal or mineral sources were in the vicinity of the settlements. The availability of native gold and copper seemed to have played an important role. This is true also of the sources of fuel, with the probable exception of the Bolivian plateau. With respect to the metals

and alloys used the evidence shows that both gold and copper were used very early. Native gold is quite abundant in South America and easy to use straight away, so that it is not surprising to find that it was chosen in most cases. Native copper is much scarcer; however not enough metallographic studies have been carried out, so it is impossible to state in which cases native copper was used. Copper minerals were certainly processed in most Chilean and Bolivian sites. Gilded copper found in the Peruvian coast is remarkable at such early dates; copper gilding is a complex and difficult process that requires good knowledge of metal properties and a precise heat control.

In most early sites the preferred technique is hammering; this is attested both in the structure of the objects as in the tools found which include hammers and anvils. Smelting must have been used wherever copper ores were processed and at Putushio where furnaces were found. The most striking feature of early technology is the processing of copper ores. The most important argument to disqualify the copper industry of the North American Great Lakes (4000 b.C.E.) as true metallurgy, is precisely the absence of ore processing. This difficult and lengthy process requiring large amounts of fuel and work, was known in South America at least by 1500 b.C.E. It must be pointed out, finally, that from its very beginnings metals seemed to have been involved in the symbolical sphere; most objects found are body ornaments; there are no traces of early metal tools.

3. The expansion and diffusion of metallurgy in the continent

Given our present state of knowledge it is very difficult to establish with an acceptable degree of certainty exactly what happened after 700 b.C.E. Probably metallurgy did not evolve in the same way in the different foci that we have identified. In some cases these local limited experimentations might have ended very quickly leaving no durable trace. A different trajectory seems to have occurred in most sites of the Peruvian northern coast and the Ecuadorian north where, from this early period onwards, it is evident that culture after culture managed to maintain metallurgical knowledge and to add new techniques and formal creations, thus building in time a millenary tradition.

Whatever the particularities were, there are some general trends that we can briefly sketch. From the central region of development of metallurgy in the Initial Period the tradition expanded both to the south and north of the continent following

always the axis of the Andes and the Pacific coast. The expansion to the south took place in an early date; by around 500 b.C.E. metallurgy was being practiced in northern Chile and north-western Argentina where several local traditions had their own particular evolution. The Tiawanaku-Wari state of Central Andes had a strong influence in those regions and later on they came under Inca rule. As we move south towards central Chile and central Argentina metallurgy is scarcer and in pre-Hispanic times it certainly did not reach the southern tip of the continent.

The expansion to the north is quite different. A very active metallurgical tradition appeared in north Ecuador - south Colombia in the Tumaco-La Tolita region of the Pacific coast around 500 b.C.E. and slowly expanded to the rest of the country. It is not until 300 C.E. that we have metallurgical activity in most of the Andean and coastal areas of the country. In the southern Andes, close to the early La Tolita focus, metallurgy appeared only 600 years later. The expansion continued to Central America, through Panama and Costa Rica (approx. 500 C.E.) and to southern and central Mexico (approx. 900 C.E.). The gold-copper metallurgy of the West Indies is much later, just prior to the Spanish conquest. In each of these regions the introduction of metallurgy was accompanied by new iconographic patterns, the preferential use either of hammering or casting and the development of new ways to use the metal and to symbolise it socially.

The geographical distribution of metallurgy is restricted; as we said it is absent in the southern tip of South America and it does not appear in the Argentinian and Uruguayan Pampa, the Chaco area of Bolivia and Paraguay, the huge Amazon basin and the rest of Brazil. In the north of the continent, finds are extremely scarce in Venezuela and the Guyana. This distribution cannot be explained satisfactorily in terms of the availability of metals and ores or with relation to the nature of the social structure of the native communities of the continent. Even within smaller geographical units it is frequent to find that metallurgy is abundant in any given area and completely absent in the neighbouring regions.

4. Central Andes: Styles, periods, cultures

In order to understand this complex panorama we need to understand how archaeologists conceive the prehistory of the Central Andes.

4.1. Central Andes – Introduction to Periods and Regions

The Central Andean region comprises the territory that is now part of the extreme north of Chile and Argentina, all of Bolivia and Peru and southern Ecuador. Broadly speaking the area is characterised by the existence of three macro-regions: the Costa or coast, mainly a deserted stretch of land bordering the Pacific Ocean irrigated by several rivers descending from the Andes; the Sierra or mountain range of the Andes which in this part of the continent is wide and high. In it there are many valleys, canyons, the enormous Titicaca plateau and several snow peak mountain chains. The third region is the Selva, a giant patch of tropical jungle which constitutes part of the Amazon basin. Most important developments took place in the Costa and Sierra, even though contacts with the Selva were frequent.

The archaeology of the region is divided into the following major time segments:

- a) Early Peopling – From 12000 to 4200 b.C.E.
- b) Pre-ceramic – From 4200 to 1800 b.C.E.
- c) Initial Period – From 1800 to 1400 b.C.E. Early metallurgy.
- d) Early Horizon – From 1400 to 400 b.C.E. Chavin and Cupisnique cultures.
- e) Early Intermediate Period – From 400 b.C.E. to 550 C.E. Vicus, Paracas, Nazca, Recuay and Mochica cultures.
- f) Intermediate Horizon – From 550 to 900 C.E. Wari in the southern Peruvian Sierra and Tiawanaku in the Bolivian plateau; together they formed the Wari – Tiawanaku state.
- g) Late Intermediate Period – From 900 to 1300 C.E. Lambayeque – Sican and Chimu cultures.
- h) Late Horizon – From 1300 to 1533 C.E. Tahuantinsuyu or Inca Empire.
- i) Conquest and Colonial Period – From 1533. Metallurgy of European influence.

Tracing the development and diffusion of metallurgy in the Central Andes is a very difficult task that has not yet been attempted in detail. There are, however, certain assumptions that can be forwarded safely. An early focus which must have endured to the point of giving birth to a lasting metal production tradition is the coastal northern one represented in the sites of Puémpaue, Huaca La Merced, Chongoyape and Morro de Etén. In there the Cupisnique tradition soon followed and was eventually replaced by the Vicus and Mochica cultures. When the influx of the Tiawanaku-Wari Intermediate Horizon receded, the Sican-Lambayeque and, in

part, the Chimu traditions built over their ancestors knowledge in exactly the same area. The north coast was, therefore, a very dynamic area for metallurgy and a region with the capability of irradiating its developments to neighbouring and distant regions. We cannot forget also that this early coastal focus was closely linked to the Sierra developments; Kuntur Wasi and Kotosh where the first stages of the Chavin metallurgy are represented. This Sierra early metallurgy evolved through Chavin to Recuay in the Early Intermediate Period; thereafter metallurgy is not the subject of local evolutions in the northern Sierra. Altogether we have important evidences to link seven major metallurgical traditions to the early foci of the north coast and Sierra.

The southern foci of the Titicaca basin with the sites of Jiskairumoko, Wankarani, Chiripa and Pucara may have played also a long lasting role in the region's metallurgy. Certainly Tiawanaku evolved a copper and bronze tradition, most probably based on these early experiences that reached northern Chile, Argentina and the central Sierra of Peru. As to what happened in the south and central Sierra and Coast of Peru, where we also have early sites such as Waywaka, Mina Perdida and Malpaso, it is still difficult to say. Now we will review the main metallurgical cultures of the area.

4.2. Central Andes, Early Horizon

The Cupisnique metal style is somewhat problematic as to its periodical setting. As we have seen previously this culture is part of the Initial Period of metallurgy in Central Andes. On the other hand its developments go well beyond this initial stage. Cupisnique culture is dated from 1200 to 200 b.C.E. in the La Libertad Department of the north Peruvian coast. At this early date this society was highly hierarchical and had the capacity to build impressive structures. At the site of Morro de Eten there are important finds of Cupisnique metallurgy accompanying what seem to be elite tombs. Gold, copper and silver were extensively worked by hammering; also copper discs were plated with gold foil. The iconography is closely related to the Chavin style and, together with the technology, it constitutes the basis for the next metallurgical styles to follow in the north coast.

The advent of Chavin influence brought up a rapid development in metallurgical technology and an increasing use of metal objects. Most Chavin objects come from elite tombs located in the valley of Lambayeque, the north Sierra and Kuntur Wasi in Cajamarca. Body ornaments are mainly made by hammering, assemblage and

embossing. There are crowns, diadems, nose rings, ear pendants, pins, spoons, necklaces and tweezers. Chavin iconography reveals a complex mythic and symbolic content that will prevail hereafter in Central Andean metallurgy. Felines (either jaguars or cougars), snakes, frogs and fabulous beasts dominate the decorative universe of Chavin. Techniques such as assemblage and painting with red and black dyes are widely used. The surface of the objects is generally golden, but the analyses have revealed the use of ternary alloys of gold, copper and silver. It is presumed that casting was employed to make ingots which were afterwards hammered to obtain the final shape of the objects.

The coherence and identity of the decoration employed in various materials; metal, pottery, stone, etc. clearly indicates that metal smiths, as well as potters and other artisans were following very strict patterns, possibly determined by religious specialists. In the Chavin Horizon archaeologists identify the first large scale embodiment of Andean ideology, a cosmology and mode of thought that dominated every aspect of human life.

4.3. Central Andes – Early Intermediate Period

Vicus, Paracas (Ica), Nazca, Recuay and Mochica cultures had begun developing during the height of Chavin. In many ways the legacy of the Early Horizon set the basis for these cultures and allowed exceptional regional expansions, having both particularities and common traits.

Most objects belonging to Nazca culture, in the southern coast of Peru, come from funerary bundles or mummies, thousands of which have been found in the desert in very good conditions of preservation. There are very large ornaments, head-dress decorations, diadems, mouth masks with snakes or humming birds, bracelets and ear pendants. On the other hand there are also miniature pieces such as representations of trophy heads. Generally speaking, objects are laminar and very well polished; hammering is the preferred technique, only in the later phases there are a few spear thrower hooks made by casting.

Recuay metallurgy of the north Sierra is largely unknown. A few analysed objects come from a tomb excavated in Pashash. Copper and copper alloys were

extensively used to produce bells, nails, ear pendants and pins, some of which were plated with gold foil, while others were decorated with stone inlays.

In **Paracas** (Ica), a huge settlement in the southern coast, well known for the existence of a large quantity of fine textiles, simple laminar ornaments of gold have been found; some are decorated by embossing. It seems to be a local industry with little influence on later developments.

The discovery of the **Vicus** culture in the valley of Piura, at the extreme north of the Peruvian coast is a relatively recent event triggered by the impounding of objects illegally dug in the sixties. In the **Loma Negra** cemetery some tombs contained over a hundred gold objects, thus emphasizing the Central Andean trend towards the large scale use of metals. Copper is predominant and it is usually plated with gold or silver. There are large discs, nose rings, staff heads, pendants and crescent moon shaped plates. Vicus iconography is closely related to the Moche culture, to the point that the same set of gods and monsters are shared by both. Recently metal workshops have been excavated in **Pampa Juárez** and **Loma Valverde**, allowing a better understanding of the relation among the casting sites, the mines and the dwelling places. Another result is a good estimative of the quantity of metal that could be processed daily and the technical restrictions of the available means of production at the beginning of the Common Era in that region.

The spectacular finds of the **Lords of Sipan** in the pyramids of the **Lambayeque** valley, north coast, in 1987, have uncovered one of the most complex and sophisticated metalworking traditions of pre-Columbian America, known as **Moche** or **Mochica**. The scientific analysis that followed have revealed that the metal smiths of this highly stratified society managed to make objects whose shape, colour and composition are difficult to replicate even today. Before the **Sipan** excavations many large **Moche** tombs had been looted, fragile corroded copper objects were destroyed and the gold pieces were sold to private collectors, thus being unavailable for study.

The **Moche** inhabited a large region in the central and north coast of Peru and constructed huge irrigation works that turned the desert into a fertile cultivating area. This, combined with intensive fishing in the rich waters of the Pacific Ocean, ensured a supply of resources that made them a rich society. At the peak of the social pyramid there were **Lords** whose political dominion had a powerful religious component. Their tombs were built inside enormous clay pyramids that look like hills in the present landscape. The abundant funerary offerings of the **Lords** give us a portrait of what the **Moche** society was like in the first millennium C.E.

Moche metallurgy employed copper massively to make objects in which this element appeared by itself, alloyed with gold, copper or arsenic, visible in the surface or covered by means of depletion, fusion or foil plating or electrochemical gilding. Surfaces may appear also smoothly polished or inlaid with emeralds, turquoise or sea shells. The variety of techniques is astonishing. Metalworking was centred on the production of ornaments for the Lords but, even so, they also made weapons and tools in arsenical copper. The ornaments of the Lords are, nonetheless, so impressive that they deserve a closer look. Typically on his head the Lord would have worn a large ornament shaped as a crescent moon, in his face he had a nose pendant, in his ears heavy spool ear pieces with hanging discs inlaid with turquoise, various necklaces, a large blanket that went down to his knees, literally covered with gold plates, semi-circular plates on his waist, coccyx protectors in his back and, finally, he would have held a large sceptre. Tombs contain many more objects; there are, in fact, several units of each of the objects described; many more than any given individual could have used at any given time.

Another striking feature of Moche metallurgy is its use of colours to portray sun – moon dualism. Some objects are made of two halves, one silver coloured and the other golden. They might also appear in pairs, one silver, the other gold. In every case, silver, the colour of the moon is on the left side of the body, while gold, the colour of the sun, is on the right. There are many evidences that the Moche kept important contacts with other neighbouring cultures of the Coast and Sierra. Thanks to these contacts many cultures that followed acquired the technical expertise and the stylistic refinement that the Moche achieved and that contributed so much to the splendour of Andean metallurgy.

4.4. Central Andes – The Intermediate Horizon

Even though most archaeologists agree that the Wari – Tiawanaku empire must have been a military state and that the peoples that came under its rule were submitted by force, the truth is that most metallic objects reflect a strong religious character, similar to the rest of the cultures of the pre-Hispanic story of the Central Andes. The advent of the **Wari – Tiawanaku Empire** brought along some interesting metallurgical developments, the most important being the extended use of tin bronze. This was possible because within the territory of the Wari – Tiawanaku state there were the large tin mines of the Bolivian plateau. However, in the north, where tin was scarce, arsenical bronze was manufactured, thus

establishing this dualism between the two types of bronzes in Central Andes, a feature that remained present for many centuries thereafter.

Gold and silver ornaments are not as refined and spectacular as the Moche ones; on the contrary, most copper, gilded copper or tombac objects are quite simple. Within this group there are many tupus, tumis and needles. A few luxury gold items tend to reproduce the figure of a deity with rectangular face with rays ending in circles, an emblematic Wari – Tiawanaku icon. This kind of pieces is scarce and they come from a few sites like Pomacanchi near Cuzco, the Ica valley to the south, Pachacamac in the Lurin valley and Ancon in the central coast. This particular inventory includes bracelets, bells, silver plated copper or gold plated silver sheets cut in the shape of human figures, head-dresses and funerary masks. In the southern coast the Wari – Tiawanaku and Nazca styles fused to produce short term local groups.

4.5. Central Andes - Late Intermediate Period

Just as when Chavin declined, the gradual disappearance of the Wari – Tiawanaku state brought along the rise of regional cultures. Now the turn came for Lambayeque - Sicán and Chimú.

The metallurgical style known as Sican was previously called Lambayeque, a name that is still used in non-specialised texts. To avoid confusions we shall refer to it as Lambayeque – **S**ican. In Peruvian museums there have been objects belonging to this style for many years, most of them coming from the Lambayeque valley in the north coast, but very little was known about them. Thanks to extensive excavations carried out in Batan Grande, at the Huaca Loro site we now have a better picture of this metallurgical tradition. These tombs are comparable in size and richness to those of Sipan, the Moche site.

In the Lambayeque – Sicán metallurgy we find yet again an emphasis on hammering and the construction of tri-dimensional objects by means of the assemblage of multiple pieces. There are animals, tumis, tupus, funerary masks, head-dress ornaments, ear spools and a special type of very deep vase, the kero, which was manufactured from a sheet, repeatedly hammered until achieving a depth of 20 to 25 cms. These keros are generally decorated with human figures. A particular anthropomorphic icon with rectangular face and rounded jaw is known as

the Sican Lord; it is very frequent in many types of objects. Copper, the preferred material, was alloyed with arsenic to produce weapons and agricultural tools and alloyed with gold and silver for ornaments. Red paint obtained from cinnabar, a mercury ore, was extensively used together with inlays of precious and semi-precious stones, shells and Spondylus.

The careful examination of the objects has revealed that there was a close connection among artisans specialised in different materials, such as the metal smiths, the stone masons, the textile weavers and the wood carvers to produce complex, multi-material objects. There are stone vases plated in gold foil, large blankets covered with copper plaques used as separations or false walls inside the temples, for example. In turn, main metal objects included textiles, feathers, precious stones, shell and wood. The result is a fantastic multi-chromatic set in which textures and colours, dark and light areas, opaque and shiny surfaces play together. Metal plaques clashing against each other during ritual dancing must have added a suggestive rhythmic sound.

The Chimu Kingdom was, doubtlessly, the largest and most powerful during the Late Intermediate Period. The Chimu conquered the central and northern coast and put an end to the Sican–Lambayeque developments. This conquest was accompanied by the imposition of the characteristic style of the Chimu Kingdom. A new icon, the Chimu Lord, an anthropomorphic figure of almond-shaped eyes, flanked by assistants with bunk beds, is popular in gold objects of that period. This icon was the subject of a careful manufacture made from separate parts that were riveted or welded together. The Chimu Lords were buried with large gold crowns with appendages imitating feathers, spool ear pendants with figures of animals assembled or inlaid in lapis lazuli, gold breastplates that covered the full torso, necklaces of spherical beads, vessels of gilded copper, headdress ornaments, dishes with intricate incised designs, tumis and tupus.

4.6. Central Andes – The Late Horizon

The process of expansion of the Incas, starting from the small chiefdom of the Valley of Cuzco, is well known in history. In some ways it was a process similar to the Wari - Tiawanaku expansion, six centuries before. What makes it special is the scale of the events; at the time of the Incas, for the first time all the regions of the coast and mountains of the Central Andes formed part of the same political entity.

With it came a profound standardisation of the life, language, beliefs and customs of the people. Metallurgy did not escape, of course, the effects of this macro - phenomenon. The Incas established control over areas of extraction of metals and mines and determined the types of alloys that should be used for tools and weapons. This led to the replacement of arsenical bronze, very popular up to then in the north Coast and Sierra in favour of tin bronze. **With** relation to the social distribution of metals, the exclusivity of the use of gold and silver was strongly ascribed to ruling groups, while intermediate groups could use gilded and silvered coppers and the rest of the population had to use copper. The scale of extraction and production of metals acquired immense proportions under a strict state control.

The ornaments of the nobles and the Inca himself, consisted of enormous headdresses, crowns, earrings, pectorals, ornaments, textiles covered with plates of gold and silver, necklaces and bracelets. To take their food they used cups, bowls and plates of gold and silver. Hammering, assemblage and inlaying of one metal into another continued being the preferred practices. They used mould casting to make countless gold and silver miniature figurines representing men, women, and llamas that were dedicated for offerings. Many of these figurines have been found at shrines located at over 4,500 meters in which young ritually sacrificed bodies were deposited.

Perhaps the most impressive example of Inca metallurgy is something which we know only through written documents because the Spanish conquistadors destroyed it altogether. It is the use of metals in religious buildings. The Temple of the Sun or Quoricancha in Cuzco was the greatest one. Those who knew it left testimony that it had a frieze made in gold sheet, one meter wide on all interior and exterior walls. The main altar had a gold disc of more than 2 meters in diameter representing the Sun and a silver disc representing the Moon of equivalent size. In other altars there were other similar discs. The mummies of some deceased Incas were on bunk beds lined in gold. A garden had a gold-plated fountain, twenty-five figures of llamas, life-size with their herders, also made of gold and a garden of silver corn plants with gold cobs. This was the most important, but not the only sanctuary of the Empire.

It took the Spaniards four months to melt in nine furnaces the objects that came from all over the Empire to pay for the rescue of the kidnapped Atahualpa. In this savage act of destruction and in many others that occurred along the empire disappeared most of the treasures whose value as a heritage of humanity is

immensely greater than what they would have had for their metal content. What has been rescued later of Inca metallurgy is only a tiny fraction that does not do justice to the scale and complexity of what was the industry of the last pre-Hispanic Central Andean artisans.

4.7. Central Andes – Summary

What we have studied as a sequence of cultures, techniques and iconographic traits can be better understood if we focus now on the trends, common characteristics and most relevant features of the metallurgy of this region of the continent:

- a) Perhaps the most intriguing and conspicuous aspect of the metallurgy of this area is its continuity. For about three thousand years, passing from one to another geographical area and from culture to culture some patterns remain invariable, both regarding technique and form. These same forms and techniques are very specific to Central Andes and disappear as you exit either to the south or to the north of it. Techniques presenting continuity include the inlaying of precious or semi-precious stones, resins, and shell, the custom of adding paint to the surfaces, sheet plating and the preference for hammering and assemblage over casting. Among the forms that pass from one to other culture are the tupus (textile pins), tumis (transverse ceremonial knives), tubular earpieces and the funerary masks. Somehow it seems that even between cultures that maintained rivalries and fought for regional dominance there was a high degree of transmission of technical knowledge and patterns concerning the function and use of metals.
- b) Even though it has already been mentioned previously, it is essential to emphasize the technological aspects as variables that mark the metallurgy in our area of interest. Normally when working metals, metal smiths have before them two technical paths that can be followed and that, regardless of the difficulties involved, can lead them to solve challenges with nearly equal efficiency. These technical roads are, on the one hand, direct work or hammering with all its complementary techniques and, on the other hand, casting or melting. In pre-Hispanic America, especially in Central Andes, what determined the preference for one or the other technique were not the practical, work efficiency, economic or purely technological reasons, but rather the cultural reasons, often religious ones. In this order of ideas we must affirm that

Central Andes metallurgy definitely adopted hammering. Casting techniques were known long ago and within reach of the smiths. However, in the overwhelming majority of the cases they were used only to obtain raw ingots. Thereafter the metal workers hammered, folded, cut and joined sheets to produce two-dimensional or three-dimensional objects that could also have been done by casting.

- c) Inlays and overlays seem to have been one of the obsessions of the Peruvian smiths. Some of the most ancient fragments of copper sheets are covered with gold foil. Over time the Central Andean smiths managed to develop various methods for coating surfaces of metal objects with layers of colour, texture, or physical properties different from the original ones. This is how fusion, depletion, plating and electrochemical methods were developed to gild and silver surfaces. These complex processes allowed changing the primary colours of copper or tombac to obtain the most varied range of gold and silver shades. In addition, various cultures developed forms to apply paints with mercury ores (cinnabar) to produce a striking red colour. At the same time artisans experimented with the inlaying of a varied repertoire of materials; precious and semiprecious stones such as emeralds, turquoise and lapis lazuli, Spondylus, amber, shells and fragments of other metals were embedded in the surface of objects or adhered to them with the help of vegetable glues. Multi-coloured objects were obtained in this way and the representation of animals, people and mythical beings became more efficient. A true inter-craft relationship was achieved.
- d) This characteristic that we described from the technological point of view can be explained also from an outstanding feature of Central Andean metallurgy, which is its great attention to colour. The efforts deployed in the production of alloys, surface treatments and inlays most of the times only had to do with the intention of obtaining one or several specific colours. Undoubtedly in the background of this techno - cultural attitude there existed a symbolism of the colours that attached to each of them and each of its tones a particular meaning. We know little concerning this, since the most ancient cultures left no written testimonies and the European chroniclers did not collect much information about it. Perhaps the clearest example of the symbolism of colours has to do with Mochica metallurgy, which seems to reflect in the costumes of the Lords the dualistic thought materialised in the opposition Sun – Moon and expressed in objects that are half gold, half silver.
- e) One of the technological aspects that have attracted most the attention of scholars is that of alloys. Even though the Central Andes metallurgy is,

foremost, a metallurgy of copper and, secondly, of gold and silver, the truth is that the indigenous smiths were not limited to the options offered to them by these three metals separately. They experienced with virtually all possible two metal (binary) or three metal (ternary) alloys. Taking into account the overriding concern for colour and secondly the need to improve hardness, ductility, malleability and flexibility, as well as to solve practical problems of supply of raw material, they resorted to mixtures of ores and native metals into furnaces. On the other hand they were not limited to copper, gold and silver in their processes of experimentation. The archaeological record is well provided with examples of arsenical bronzes, tin bronzes, alpaca (silver – lead) as well as exotic alloys only recently known to us (bronzes having copper - arsenic – nickel or copper – bismuth). Even though many of these alloys might come initially from accidental events, such as the use of minerals containing arsenic as an impurity, soon the qualities of the alloys were understood and its intentional use continued consistently.

- f) The symbolic nature of metallurgy has strongly attracted the attention of those who have studied this tradition in the Central Andes. It is this feature which explains the great attention paid to the texture and colour of the surfaces and the pursuit of different alloys. It has been noted that the main difference between metal industries of the Old and New Worlds lies in the fact that in the first one metalwork is oriented toward utilitarian uses (weapons, tools) while in the second it dealt more with ornaments and offerings. As far as this statement refers to the Central Andes it is true only in part, as in here huge amounts of weapons and agricultural tools were made along with objects of adornment and offering. However, the metal does not seem to have lost its sacredness at any time. Bundles of agricultural tools, weapons of war, ingots and even scraps of metal were used as offerings in the tombs of the Lords of Sipan and Sican. In daily life this sacred and symbolic character of the metal manifested itself in a differential social use; gold and silver were reserved for the elites while ordinary people used almost exclusively copper and bronze.
- g) An important characteristic of the Central Andean metallurgical cultures was the creation of icons. In the Chavin, Mochica, Sicán and Inca metallurgy it is evident that there was a prototype whose manufacture was subject to strict rules that guaranteed that whenever it appeared it would look exactly the same. Because of this we can recognize anywhere any certain deity or a specific Lord whose portraits become repetitive.
- h) The periodic sequence of the pre-Hispanic history of the Central Andes, as it has been exposed previously, shows an alternation of periods of differentiation

and standardisation of cultures. This dialectic between the forces that lead to the imposition of homogeneous techniques and iconography and those that allow experimentation and diversity is palpable in metallurgy. For over three thousand years Central Andean metallurgy tilted between these extremes.

- i) There is one final aspect that cannot escape this analysis. In contemporary civilizations we are used to measure the production of metal in thousands and millions of tons. In the ancient world the production of considerable masses of metal involved huge amounts of work; basic ores were difficult to extract and refining techniques prior to smelting were poorly known, the furnaces were small and it was a difficult problem to achieve and maintain the temperatures needed for melting metals and separating them from the slag. In most of the pre-Columbian archaeological record, it is usual to find tons of ceramics together with only a few kilograms of metal. Even in this context, it must be said that the production of metals in the Central Andes operated on a large scale. In a single stately Sicán tomb more than 500 kilograms of scrap metal were found; any of the stately tombs of Sipan contained more than one hundred adornments belonging to a single individual; the weapons and tools housed in Peruvian and foreign museums can be counted by the thousands; in the years that followed the fall of the Inca Empire the mines of the Tahuantinsuyu produced nearly 190 tons of gold and 635 tons of silver every year. The looting of Cuzco and the rescue gathered by the Empire to pay for the kidnapping of the Inca Atahualpa reported the Spaniards 61 tons of silver and 8 of gold. The five hundred years of looting that followed should have produced for the thieves of graves, illegal traders and collectors, similar quantities. We do not include in this account copper and bronze objects that were left aside. This scale of exploitation and production of metals has no parallel in pre-Columbian America.

5. Bronzes from the Argentinian northwest

The Argentinian northwest comprises a large region of valleys and alluvial plains in the provinces of Catamarca, Rioja, Salta and Jujuy, in the eastern foothills of the Andes. Metallurgical experimentation started in this area as early as 500 b.C.E. By the first centuries C.E. both arsenical and tin bronzes were manufactured. Important technological improvements were achieved during the Aguada period (400 – 900 C.E.) and by 1000 C.E. large scale production started. Metal smiths in this area produced small quantities of gold objects used as body adornments. Tin bronze is the preferred type of alloy, both for ornaments and utilitarian objects. The technique employed in most cases is casting in open moulds followed by

hammering. This secondary technique was used mainly to obtain and harden cutting edges. Objects manufactured include ceremonial axes, large oval bells and circular plaques.

In the province of Catamarca a large bronze-producing workshop was excavated. The site is known as Rincon Chico and there is ample evidence of uninterrupted metallurgical activity for 600 years. In an area of about 1,500 square meters there are large circular casting structures, huge quantities of slag, metal scraps, casting moulds, metal ores, stone tools, and partially burnt fuel. The scale of production must have been very large indeed and it is possible that such workshop could have provided finished objects that were traded at long distances both to the north and south. The area was conquered by the Inca Empire around mid-15th century and thereafter metallurgical production was regulated by the strict imperial rules. It is believed that the Incas were especially attracted to this area precisely by the wealth represented by the large metallurgical production.

6. The Atacama and northern Chile

The Atacama Desert and northern Chile are one of the richest areas of the world in terms of copper mines. There are early evidences of copper mining in this area, including miners who apparently died when the tunnel in which they were caving collapsed in the mine of Chuquicamata, in the sixth century C.E. One of them was found in the 16th century, another one in 1899. Ancient copper mines have been documented in other sites like La Serena, El Salvador, Calama and Copiapo. A workshop was found in Ramaditas with abundant evidences of metal work including slag, copper ores and complete finished objects dated to the 1st century C.E. Further south, in central Chile copper objects are scarcer; most are body ornaments belonging to the Aconcagua phase and dated to 950 C.E. Most copper objects in Chilean museums lack burial contexts and it is difficult to assign dates or cultural affiliations.

A singular set of tombs appeared in the Casa Parroquial cemetery, San Pedro de Atacama. Funerary offerings included objects made in gold, silver and copper. A couple of keros or ceremonial vases show a close relationship with similar Tiawanaku objects. There are also a “portrait vase”, diadems, axes, rings, tupus and hammered sheets. Dates range from the fifth to the ninth century C.E. Up to now this one is an isolated find, not indicative of the existence of a local gold working industry in the area, but rather an extension of the Tiawanaku influence.